

REMARKS

The application has been reviewed in light of the Office Action mailed on November 22, 2005. Claims 22, 27, 28, 33, 40 and 41 have been amended without adding new matter. Reconsideration is respectfully requested for the following reasons.

Claims 22-33, 40 and 41 stand rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. In particular, the Office Action asserts that a “barrier disposed over the insulating layer” is not described in the specification, and that the specification “merely describes the barrier layer 59 formed in the trench of an insulating layer 54.” Office Action, page 2. Independent claim 22 has been amended to recite “an insulating layer having a plurality of grooves formed therein; [and] a barrier layer in each of said plurality of grooves.” Independent claim 28 has been amended to recite “an insulating layer having trenches formed therein; [and] a barrier layer formed in said trenches in the insulating layer.” Thus, the rejection has been overcome, and all of the pending claims are in full compliance with 35 U.S.C. § 112.

Claims 22-33, 40 and 41 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Ning, U.S. Patent No. 6,709,874 (“Ning”). Reconsideration is respectfully requested.

Claim 22 has been amended to further distinguish over Ning. Claim 22 recites a “barrier layer in each of said plurality of grooves [of the insulating layer, and] longitudinally extending conductive lines formed over said barrier layer ... , said barrier layer and said conductive lines having upper surfaces.” Amended claim 22 now recites a “planarized conductive material layer formed over said upper surfaces of said barrier layer and said conductive lines.”

This is an important feature of the invention because it provides a more planar surface prior to deposition of the magnetic stack of the MRAM. For example, with reference to Figures 12 and 13, the specification discloses that a “conductor layer or material layer 63 is formed over the upper surface of barrier 59, [and] metal line 62” Specification, ¶ [0043]. The specification also discloses that a “top portion of the second conductor layer 63 is planarized and a lower portion of the second conductor layer 63 remains intact, conformally covering roughened portions 62a [of the conductive line] and protruding portions 59a [of the barrier layer].” Specification, ¶ [0044].

Ning fails to teach or suggest this limitation. Ning teaches an MRAM device having a conductive line 218 inside a liner 216. Ning also teaches providing a metal cap layer 220 on top of conductive line 218. Significantly, and opposite to the claimed invention, Ning teaches that the metal cap layer 220 is to be provided only over the top of the conductive line 218 and not over the top surfaces of the liner 216. According to Ning, “[a]fter the CMP process, a portion of the first metal cap layer remains on top of the first conductive lines 218 within the recess.” Column 6, lines 42-44. Thus, the claimed invention represents an improvement over Ning by providing a more planar surface prior to deposition of the magnetic stack of the MRAM.

For at least this reason, amended claim 22 is allowable over Ning. Claims 23-27 and 40 depend from claim 22 and contain every limitation of claim 22. Claims 23-27 and 40 should be allowed based on at least the same reason claim 22 is allowable, and also because the unique combinations recited in the dependent claims are neither taught nor suggest by Ning. For example, claim 26 recites that the “conductive material layer is formed to a thickness of about 5 nm to about 20 nm.” Ning, on the other hand, teaches that the preferable range for its cap layer is from 25 to 100 nanometers. This is an additional reason for allowance of claim 26.

Claim 28 has been amended to recite a “barrier layer formed in said trenches in the insulating layer; a conductor formed over the barrier layer, said barrier layer and conductor having a top surface.” Amended claim 28 recites a “planarized conductive material layer provided over said top surface of said barrier layer and said conductor.” For similar reasons as discussed above with respect to claim 22, claim 28 distinguishes over Ning. Claims 29-33 and 41 depend from claim 28 and contain all of the limitations of claim 28, and should be allowed for at least the same reason their base claim is allowable, and for other reasons.

Claims 22, 25, 27, 28, 31, 33, 40 and 41 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Jones et al., U.S. Patent No. 6,555,858 (“Jones”). Reconsideration is respectfully requested.

Claim 22, as amended, recites a “planarized conductive material layer formed over said upper surfaces of said barrier layer and said conductive lines.” Jones fails to teach or suggest this limitation. Jones teaches a dielectric layer 224 having trenches therein. Inside the trenches, Jones teaches forming a high-permeability (liner) layer 226, and a conductor 228 inside the liner 226. Jones also teaches forming a conductive layer 232. Contrary to the claimed invention, and as plainly seen in Figures 4 and 5 of Jones, the conductive layer 232 is not formed over the upper surfaces of the liner 226. Thus, the claimed invention provides an improvement over Jones.

For at least this reason claim 22 is allowable over Jones. Claims 25, 27 and 40 depend from claim 22 and should be allowed for the same reasons as for allowance of their base claim, and for other reasons.

Claim 28, as amended, recites a “planarized conductive material layer provided over said top surface of said barrier layer and said conductor.” For similar

reasons as discussed above with respect to claim 22, amended claim 28 distinguishes over Jones, and is allowable. Claims 31, 33 and 41 depend from claim 28, and should be allowed together with their base claim, and for other reasons.

Claims 23, 24, 26, 29, 30 and 32 stand rejected under 35 U.S.C. § 103 as being unpatentable over Jones as applied to claims 22, 25, 27, 28, 31 and 33 above, and further in view of Ning. Reconsideration is respectfully requested. As discussed above, amended independent claims 22 and 28 are allowable over Jones. Ning adds nothing to Jones to remedy its deficiency with respect to claims 22 and 28, because, as discussed above, claims 22 and 28 are allowable over Ning for similar reasons. Moreover, Applicants do not agree that the references are properly combinable as asserted in the Office Action because there is no motivation in references to make the proposed combination. For at least the foregoing reasons, this rejection should be withdrawn.

Claims 22-33 stand provisionally rejected under the judicially created doctrine of obviousness-type double patenting over claims 43-67 of copending U.S. Patent Application No. 10/196,933. Applicants will address the rejection when it is no longer provisional.

In view of the above amendments and remarks, Applicants believe the pending application is in condition for allowance.

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Respectfully submitted,

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